# Project Idea

- Every year, millions of pounds of hair end up in landfills (Ruiz).
- Felted hair mats are already used to clean up oil spills, but they have additional uses (Shah, 2020).
- Hair mats can also be used as a biodegradable alternative to mulch (Carenini).
- Some benefits of using hair mats could be to reduce watering needs, keep away pests, and increase crop yield ("How It Works").
- However, there have been few studies on this, so I wanted to research it more.



Hair mats drying in the greenhouse (Taken by author)

# Hair Mats

- Matter of Trust, a nonprofit, has been developing mats made out of hair ("Clean Wave").
- Human hair absorbs oil, so they began to make felted hair mats to be used to clean up oil spills ("Clean Wave").
- While that is the main use of these hair mats, another potential application is using hair mats as an alternative to mulch to help with water retention in soil and provide nutrients to the soil (Carenini).

## Agate Glycine max -Soybeans

- I decided to test the impacts of hair mat use on Agate Glycine max (soybeans).
- They mature quickly and have a short growing season ("Agate, Bean").
- They need to remain well watered ("Agate, Bean").
- Considered #6 most important crop in the world (Goldschein, 2011).



Agate soybeans (Image from ufseeds.com).

### **Research Question**

 What is the impact of hair mats on soil moisture and Agate Glycine max growth rate?

# Hypothesis

• The use of hair mats will increase soil moisture levels and consequently increase *Agate Glycine max* growth rate.

# **A Hairy Situation**

#### The effect of hair mats on soil moisture and Agate Glycine max (soybean) growth rate. By Dora Fields

#### Procedure



Add water in 20 mL increments to a pot of dried soil and measure each time to convert the arbitrary soil moisture scale to percent saturation.



Germinate soybean seeds and plant them in 16 pots.



When they reach approx. 5 in, place hair mats on top. Watering system is a drip hose set up with a timer to water the pots with 200 mL every 4 days.



Use a soil moisture sensor to collect data and measure heights for one month (30 days).

#### Variables

- Dependant: Soil moisture levels (taken first using arbitrary scale on sensor, then converted to %H<sub>2</sub>O saturation), plant height (in cm)
- Independant: Hair mats
- Constants: 8 plants for each experimental group, same temperature, 200 mL of water every 4 days, light exposure
- Control: No hair mats
- Trials: 2 trials, each one month with 16 plants

#### Data:



Date

#### Soil moisture curve used to convert arbitrary scale on reader to $%H_2O$ saturation.

Hair Mats vs. No Hair Mats: Average Plant Height Trial 2



Average height in plants with hair mats vs. no hair mats. Trial 2's data represents the trends in both trials.

Average %H<sub>2</sub>O Trial 2's data is representative of the trends in both trials.

	Treated with hair mats	Not treated with hair mats
Total	Trial 1: 3.4 cm	Trial 1: 2.6 cm
change in height in plants	Trial 2: 15.4 cm	Trial 2: 12.6 cm
Average	Trial 1: 74.54%	Trial 1: 60.54%
%H₂O saturation	Trial 2: 68.42%	Trial 2: 57.76%

# Data Interpretation

- With hair mats the average water saturation was consistently higher than those without mats. On average, the average H<sub>2</sub>O percent saturation of the experimental group was 23.625 more than the average H<sub>2</sub>O percent saturation of the control.
- The change in height from the beginning of the experiment to the end was, on average, 1.8125 cm higher for the plants with hair mats.

# Sources of Error

- Inconsistent watering system, took a bit of troubleshooting.
- Hair mats of varying thicknesses, from 0.65 cm to 1.42 cm.
- Greenhouse heating system turned off midway through first trial.



Left: Small pod on soybean plant (Taken by author)

Right: Plants in greenhouse during Trial 1 (Taken by author)



### Conclusions

- The purpose of the study was to find the impact that the use of hair mats has on soil moisture saturation and *Agate Glycine max* growth rate.
- Using hair mats increased soil moisture percent saturation by 23.63 percent and increased the growth rate of Agate Glycine max by 1.81 cm.
- Hypothesis was supported by data.
- Hair mats were able to lessen evaporation by reducing water and vapor exchange between the soil and atmosphere.



Plants in greenhouse with hair mats at the end of the trial 2 (Taken by author)

#### Project Improvements & Future Experiments

- Try with different plants in the future.
- Try with a bigger sample size.
- Use thicker vs. thinner hair mats.
- Increase number of trials.
- Use a more exact form of measurement.
- Compare to mulch and other mulch alternatives.
- Longer trial in order to observe possible nutrient transfer.
- Use leaf spectrometer.

#### References

"Agate, Bean Seeds." Urban Farmer Seeds. Accessed 7 Apr. 2023.

Carenini, M. "Human Hair Mats to Increase Food Production." *Matter of Trust*. Accessed 7 Apr. 2023.

"Clean Wave Program." *Matter of Trust*, matteroftrust.org/clean-wave-program/. Accessed 7 Apr. 2023.

Goldschein, Eric. "The 10 Most Important Crops in the World." *Business Insider*, 20 Sept. 2011 Accessed 7 Apr.

2023.

"How It Works." *Smart4Growing*. Accessed 7 Apr. 2023.

Ruiz, Arabella. "Is Hair Biodegradable or Does It Harm the Environment?" *The Roundup*. Accessed 7 Apr. 2023.

Shah, Janvi Manish. "Use of Hair Mesh for Oil Spill Management." International Journal of Creative Research

*Thought*, vol. 8, no. 7, July 2020, pp. 3384-87 Accessed 7 Apr. 2023.